WHY FINANCE THE HYDROGEN HIGHWAY?

H_2HNet
Economy
Topic Team
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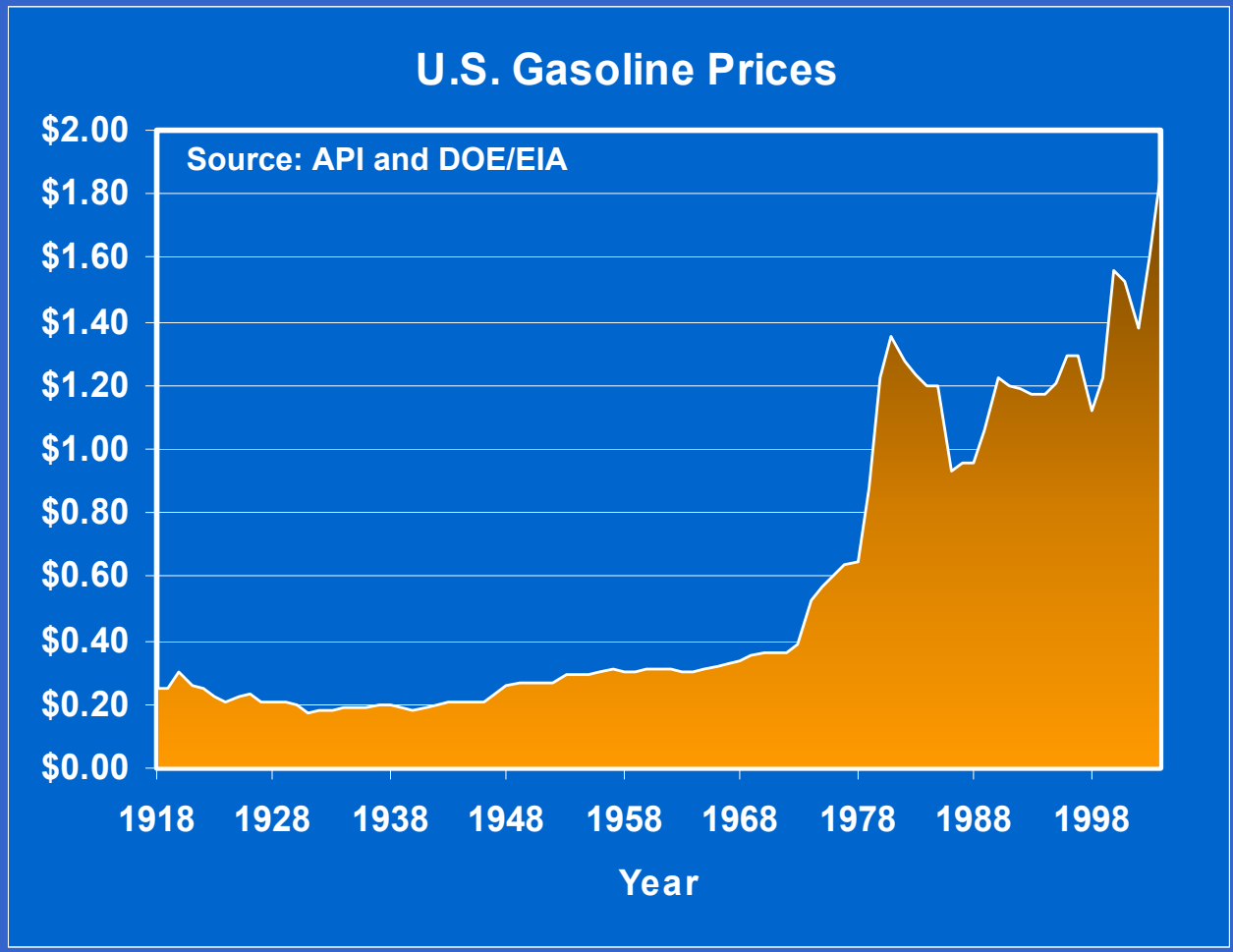
Prologue

- "…the Economy Team sees a potential for funding to come from private financing sources…
- "…there may be a need for more broad-based revenue mechanisms to support H_2HNet… the benefits of the H_2HNet will be both *public* as well as *private* in nature."

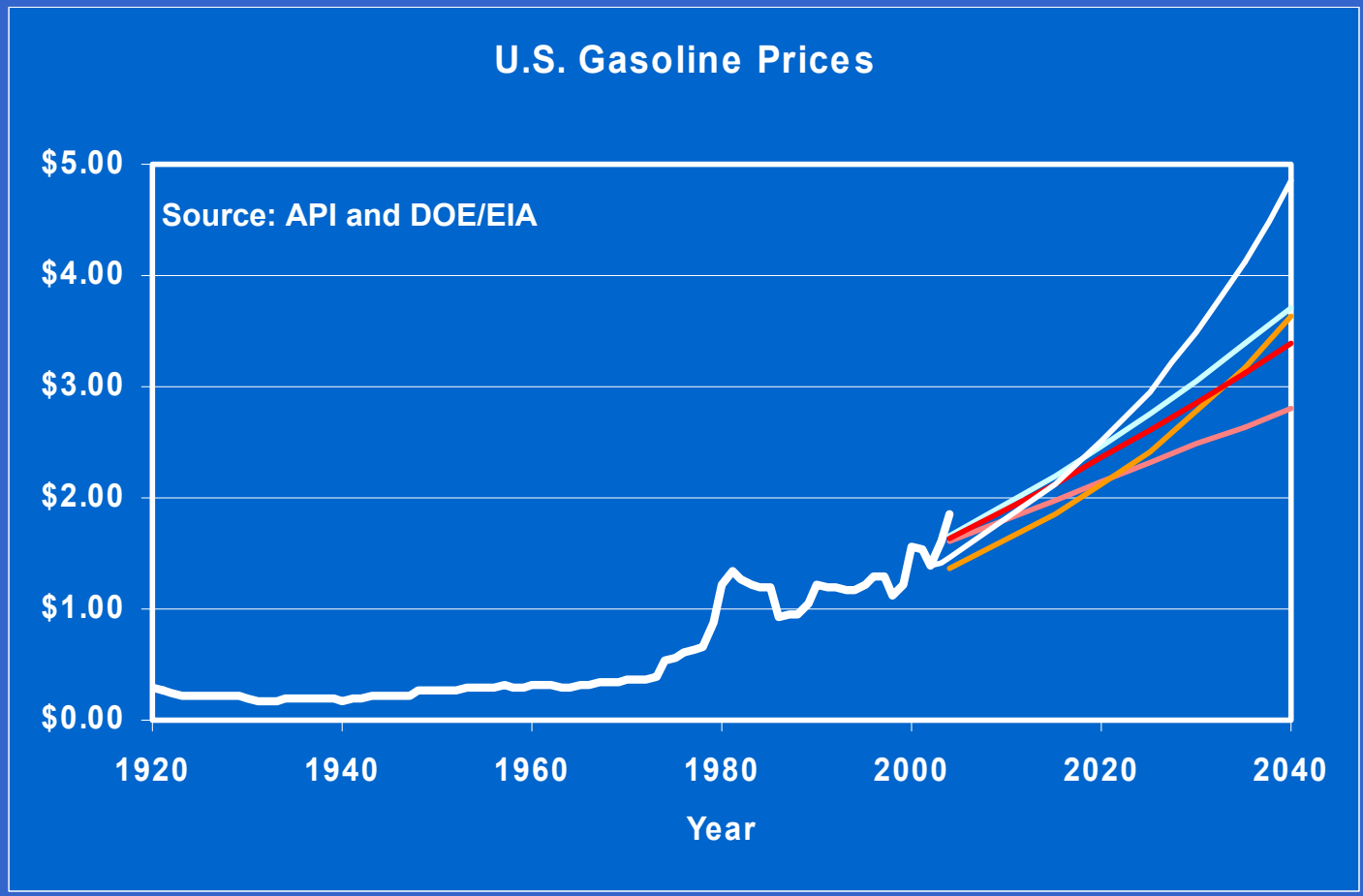
Premise

- How we finance the Hydrogen Highway should be coupled to “Why”

Competitive Fuel Prices



Competitive Fuel Price



Comparative Costs

- Current cost of gasoline: $1.86/gallon
  - U.S. average across all grades
- Current cost of hydrogen: $7.40/gge
  - Assumes:
    - $1.20/100 ft^3 delivered cost of liquid
    - 146 % total O&M, Cap Rec and profit
- DOE target (2010)
  - reduce hydrogen cost to $1.50/gge from the current $5.00/gge

Comparative Costs

- Future cost of gasoline?
  - Current trends and economic forecasts suggest $1.80 - $2.10 by 2010 (national average)
- Future cost of hydrogen?
  - Cost increases with natural gas (~ 60 % of production cost)
  - May be flat through 2010

Cost Implication

- Hydrogen vehicles expensive
- Hydrogen fuel expensive
- Ergo:
  - Early users (non-public early adopters) will be 'well to do'
    - Not affected by high prices
    - Attracted by uniqueness, exclusivity

Why Bother?

- Hydrogen cannot compete with gasoline on a cost per unit energy basis
- Increased fuel efficiency not likely to make up the difference
- Not obvious how mass introduction can happen soon

➢ No clear model for private investor ROI

Why Indeed?

- Parallels in development of agriculture

19th Century Agriculture

- Population growth exceeding food supply
- Crisis looming – but when?
- Agriculture discovers “nitrogen fertilizer”
  - Food production dramatically increased
  - Largest single source: Chilean guano deposits
  - Limited in scope, difficult to supply

Dawn of the 20th Century

- Fritz Haber develops chemical process for producing ammonia
  - 1918 Nobel Prize
- Future food supply crisis averted
- Today, ammonia is 2nd only to sulfuric acid in terms of chemicals production world wide
  - Used mainly for fertilizer
  - 40 % of world population alive because of ammonia

But…

- 35 years passed before significant quantities of ammonia were produced for fertilizer

In the mean time…

- Farmers learned more about how to use ammonia as fertilizer
- Different applications for ammonia provided experience, cost reductions
- Transportation, distribution infrastructures were tested and refined

So…

- Food crisis averted
  - Environment was ripe for discovery
  - Society was prepared
  - This is where we should be headed

Now do you understand the ‘Why?’

What Now?

- Hydrogen Economy Inevitable
  - Technology not ready
  - Energy supply not yet critical
- Need to be prepared
  - Avert crises

- H_2HNet is a key component

Financing H_2HNet

- Not a private equity investment
- Not entirely a publicly-funded venture

Financing H_2HNet

- Mandates (Incentives) to petroleum fuel suppliers
  - Marginalize investment on their part
  - Avoid technology-specific approach
  - Work through quid pro quo (marketing, publicity, clean air credits, guaranteed customer base, etc.)

Financing H_2HNet

- Gasoline Tax Redistribution
  - Probably not feasible
  - Would likely require an increase in the gasoline tax
- Carbon Tax
  - Too aggressive
  - Needs to be broader based – not limited to H_2HNet

Financing H_2HNet

- Encouraging utility participation
  - Be careful
  - Technology not quite there yet
  - Spinning reserve concept may not pan out
  - Better to motivate than to mandate
  - Leave lots of room for innovation

Financing H_2HNet

- Revenue or General Bonding Measures
  - Revenue Bonding
    - Normally requires payback
    - Where will revenue be generated?
      - Early technology not suitable for longer term
  - General Bonding
    - Again, how will they be paid back?

Financing H_2HNet

- Don’t forget the Vehicles
  - It won’t work without the cars – no matter what else you do
  - Mandate public fleet participation
  - Mandate usage of “public” hydrogen refueling stations
  - Remember 13 CCR 2300 et seq.

Closing Thoughts

- This needs to be done – we need to prepare
- California needs to take the lead
  - If not, we'll be buying the technology from someone else later – at a higher price
  - We also have more at stake than just energy
    - Clean air, for example?
- No real profits for a long time
  - Adopt policies accordingly
- Remember ammonia